Monday, May 12, 2008

Westchase Hilton • 9999 Westheimer
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $30 Preregistered members; $35 non-members & walk-ups

The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail reservations@hgs.org, or call the office at 713-463-9476 (include your name, e-mail address, meeting you are attending, phone number and membership ID#).

by ***T.R. Wiseman, P.R. Ballin, M.C. Lederer, R.N. Wagerle,*** *and* ***N.F. McCaslin***
BP America Inc.

Multidisciplinary Reservoir Description to Characterize Connectivity in a Complex Minibasin Fill: An Integrated Approach at Holstein Field

Holstein is a BP-operated, deepwater oil field located in the Gulf of Mexico. Reservoirs comprise stacked, Pliocene turbidite sands with the field formed by a large, steep, southeasterly dipping, monoclinal structure. Early performance of the field showed a sharper production decline than predicted by the sanction study. Dynamic simulation of early wells suggested limited drainage acreage confined by baffle regions with limited connection to the larger reservoir. A campaign of surveillance data was carried out. Subsequent drilling indicated the reservoirs, originally modeled as being in pressure isolation, were experiencing pressure-depletion through connections between reservoirs. A major effort was undertaken to recharacterize the reservoir, rebuild the static model and generate new dynamic simulations to update the development strategy and develop a mitigation plan.

The sanction case geological model described the reservoir sands as deposited in a ponded, intraslope salt basin dominated by thick, amalgamated reservoirs with internal homogeneity and excellent connectivity. The subsequent recharacterization describes reservoir architecture elements composed of sandy sheets and channels that shingle to form genetically related reservoirs. Baffling between geobodies and pressure-isolated compartments between some shingles are also recognized. Post-depositional modification of the reservoir further complicates well performance by removing the reservoir entirely or reducing its thickness. A structural overprint creates deformation bands that appear to reduce well productivity through the reduction of effective permeability in the structurally steepest segment of the field. In addition, seismically resolvable faults, originally thought to be sealing, are modeled as having variable transmissibility and allowing cross-flow between the complex reservoirs.

seismically resolvable faults, originally thought to be sealing, are modeled as having variable transmissibility and allowing cross-flow between the complex reservoirs

HGS General Dinner Meeting *continued on page 15*

Figure 1. Location of the Holstein Field with other numerous discoveries, planned developments and existing production within BP's Gulf of Mexico deepwater portfolio.

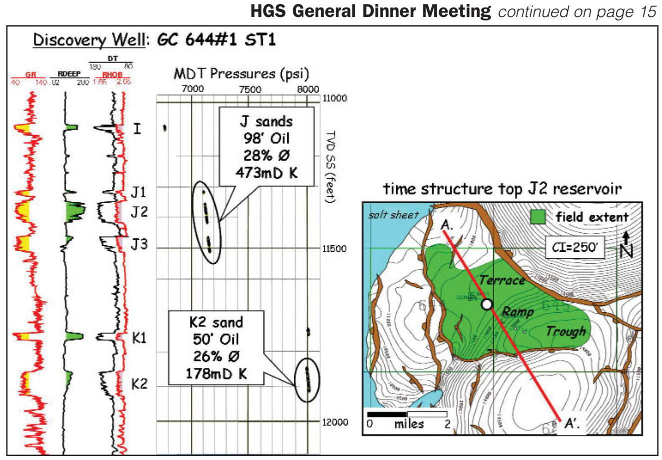

Figure 2. Well logs from the sidetrack to the discovery well (GC 644#1 ST1) with informal reservoir nomenclature indicated. MDT pressure vs. depth plots indicate reservoirs exist in pressure-isolated compartments. Field outline indicated on struacture map to right.

 continued from page 13

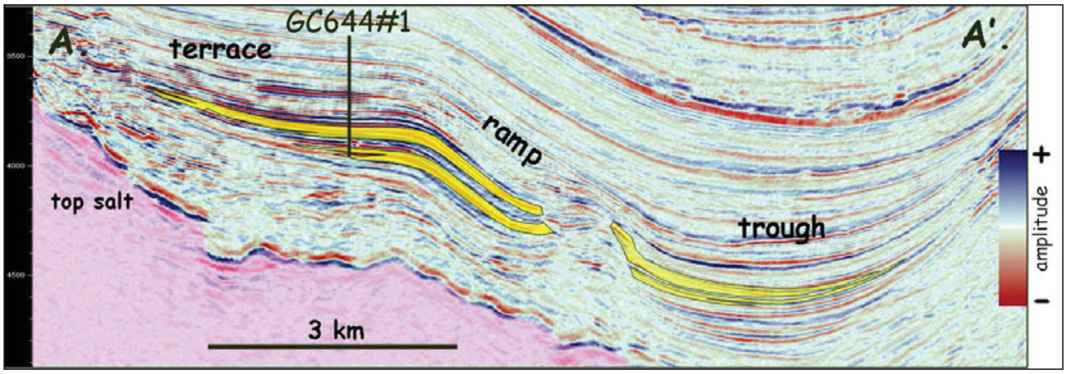

Figure 3. Structural cross section A-A'; location shown in figure 2. Oriented northwest-southeast showing the field in profile with the terrace, ramp and trough labeled. Reservoirs are shown in yellow and allocthonous salt is interpreted in pink. Modified from Tom Byrd.

A revised heterogeneity model calibrated with dynamic data allowed greater understanding of the well performance variations. The assisted history-match approach of Top-Down Reservoir Modeling (TDRM) was utilized to handle the main uncertainties in the field and reach multiple models with a good match to all production and pressure data available. These models allowed the analysis of production strategies for optimizing recovery. The data that guided this model rebuild, the integrated modeling process used, and the resulting impacts on the depletion plan are described in this work. ■

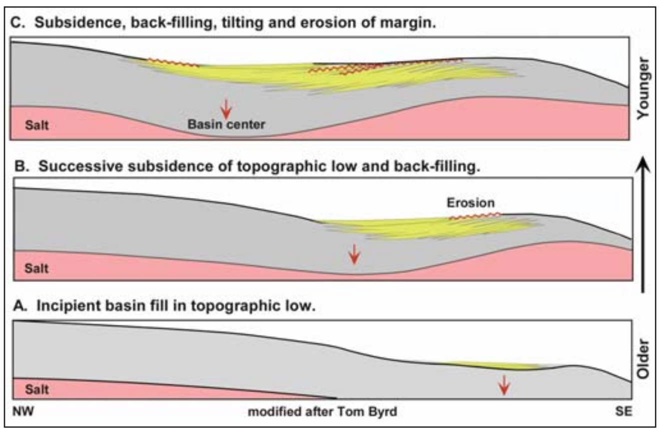

Figure 4. This basin fill model describes the back-stepping nature of the reservoirs with older sands at the bottom, younger to the top. The basin depocenter migrated SE to NW due to differential. allochthonous salt withdrawal. Individual reservoirs are segregated from one another by fine-grained turbiditic silts asands and shales.

Biographical Sketch

Paulo Ballin earned a BS in civil engineering and an MSc in petroleum engineering in Brazil and PhD from Stanford University. He worked for Petrobras (Brazil) for 18 years in reservoir management, enhanced recovery and mainly reservoir modeling. In July 1998 Dr. Ballin joined BP Technology Group in Houston, working in integrated reservoir studies and 3D modeling. Between 2003and 2005 he worked in Trinidad for BP performing several reservoir modeling studies, developing a reservoir performance data base and participating in the business unit reserve and long-term plan. In 2006 he returned to the Technology Group in Houston. Besides participating in several integrated reservoir studies, Dr. Ballin has been coordinating two R&D projects: one on reservoir production assisted history matching and the other on tight gas reservoir modeling. His main areas of interest are the integration of geosciences with flow simulation modeling and the assessment of geological uncertainty.

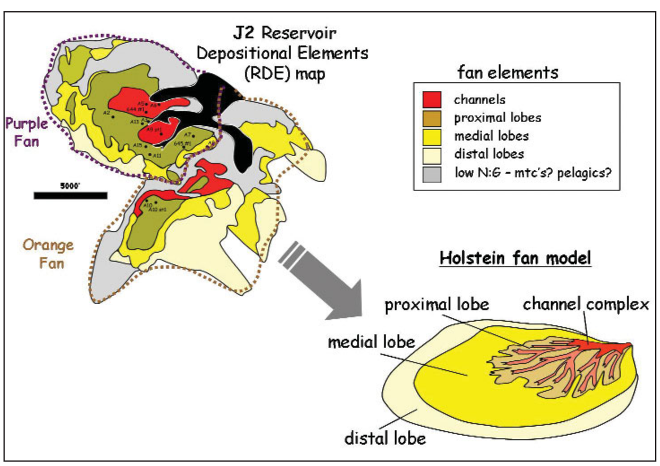

Figure 5. Seismic facies are used to generate an architectural elements (or reservoir depositional environment) map which shows the internal facies heterogeneity of individual fans. In addition to the depositional elements, we capture the post-depositional erosional zero edges.